DEPARTMENT OF GREEN CHEMISTRY AND TECHNOLOGY

Manure in the European Circular Economy: turning a hindrance into an opportunity

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Context

While livestock husbandry contributes to the livelihood of millions of people, intensive animal farming can lead to environmental challenges such as **GHG emissions** and **leaching of nutrients** into bodies of water. Gross nutrient balance data (Fig. 1, A) points towards a **nitrogen surplus** trend in the EU, with **nutrient hotspots** overlapping areas traditionally associated with intensive livestock production such as Belgium (132 N kg/ha, 2015) and the Netherlands (199 N kg/ha, 2016) (Fig. 1, B).

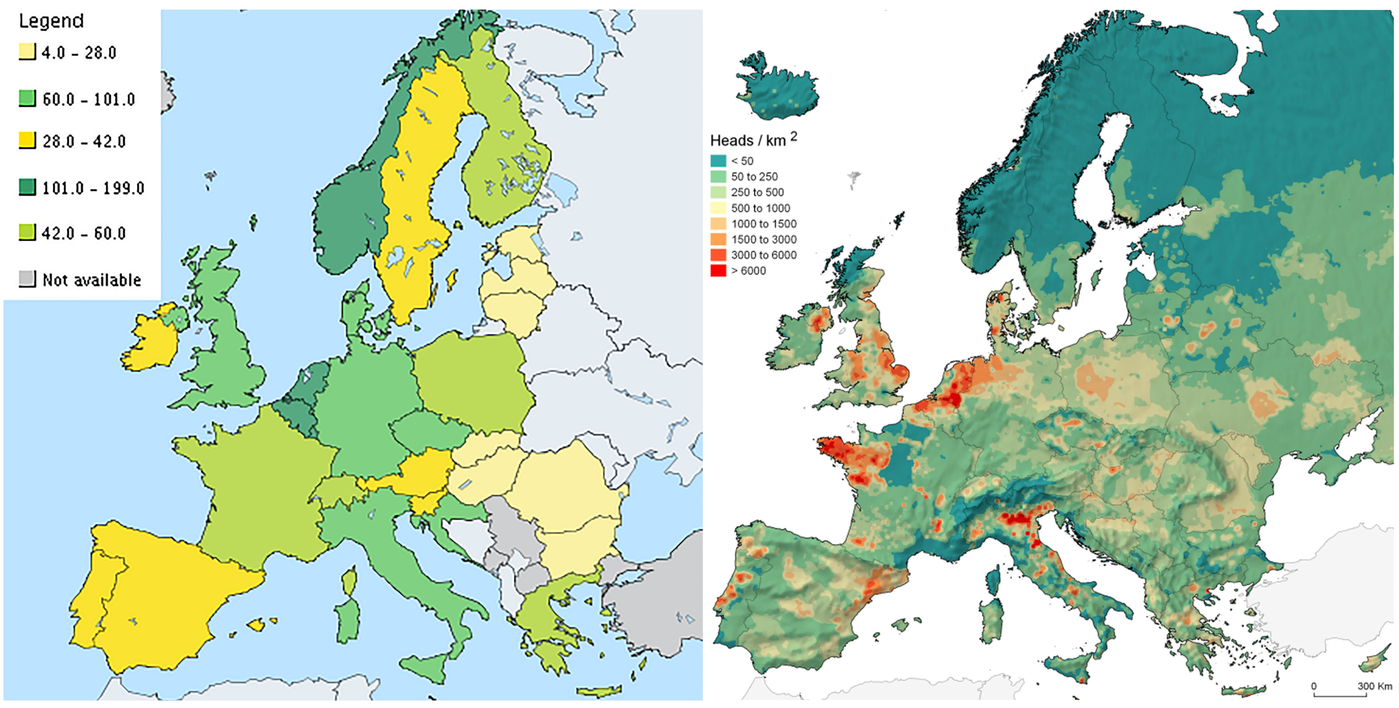

Fig. 1. (A): Gross nitrogen balance on agricultural land (kg/ha/y) (Eurostat, 2016) ; (B): Spatial distribution of livestock and poultry (heads/km²) (JRC, 2018).

Problem

Under the current **Nitrates Directive** (91/676/EEC), these new bio-fertilisers - which can be partially or entirely derived from livestock manure - fall under the 170 kg/ha/y limit.

This hampers technological and market development for the recycling of nutrients within the circular economy. In **Nitrate Vulnerable Zones**, paradoxical situations can emerge where farmers have excess manure but must still rely on synthetic fertilisers to meet crop requirements, as only these are not restricted.

Opportunities

H2020-funded projects **SYSTEMIC** and **NUTRI2CYCLE** are at the leading edge when it comes to providing **innovative solutions to nutrient surplus** by recovering mineral nutrients from organic waste streams, such as digested manure. The recycling and reuse of nutrients allows for targeted fertiliser application while also serving as a resource-efficient waste management system within the **circular economy**.

In the EU, a**naerobic digestion** (AD) is a proved and tested technology with 17,783 biogas plants in 2017 and a dynamic biomethane sector - which leapt from 187 plants in 2011 to 540 in 2017 - representing an increase from 752 to 19,352 GWh in only 7 years (EBA, 2018). AD is a mature technology which, associated to projects such as SYSTEMIC and NUTRI2CYCLE, can turn the environmental issues associated with manure surpluses from a hindrance into an opportunity.

Perspectives

The European Commission has acknowledged the gap which exists between the opportunities made available through research and innovation, and the Nitrates Directive, which in its current form tends to curb the use of bio-fertilisers derived from manure. Consequently, the **SafeManure** working group has been developing criteria for N-rich manure-derived materials which can act as chemical fertilisers. Such materials are known under the acronym **RENURE** for "REcovered Nitrogen from manURE".

SafeManure's latest draft (September 2019) has given cause for cautious optimism as it provisionally concludes that RENURE products do not pose "unacceptable environmental impacts or human health risks". Moreover, it acknowledges the key role these products have to play within the circular economy for a better management of manure and for an "increased resource efficiency in the EU food production system". If AD is backed by adequate policies, it can undoubtedly make a significant contribution towards reaching the goals of sustainable development, energy and climate-neutrality the EU has set for itself. However, it remains to be seen whether these tools will be exploited to their full potential by policymakers.

Acknowledgments

- **Systemic**: https://systemicproject.eu/
- **Nutri2Cycle**: https://www.biorefine.eu/projects/nutri2cycle

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References

- **EBA**, (2018). Statistical Report of the European Biogas Association 2018. Brussels, Belgium, December 2018.
- **Eurostat**. Gross nutrient balance on agricultural land by nutrient.
- **Scarlat, N., Fahl, F., Dallemand, J-F., Monforti, F., Motola, V.** (2018). A spatial analysis of biogas potential from manure in Europe. Renewable and Sustainable Energy Reviews, 94, 915-930.

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